Amendments to the Claims

Please withdraw claim 54 without prejudice to consideration of this claim upon allowance of a generic claim. Following is a complete listing of claims, as amended:

1. (Previously Presented) A method for forming a planarizing pad for planarizing a microelectronic substrate, comprising:

selectively exposing a first portion of a surface of an energy-sensitive planarizing pad material to a selected energy source without exposing a second portion of the surface facing in generally the same direction as the first portion and adjacent to the first portion, the energy-sensitive planarizing pad material including fixed abrasive elements for abrading the microelectronic substrate; and

forming a plurality of recesses and contact surfaces at the surface of the planarizing pad material configured to support a planarizing liquid proximate to the surface of the planarizing pad material during planarization of the microelectronic substrate by exposing the planarizing pad material to a solvent to remove material from one of the first and second portions of the planarizing pad material at a greater rate than removing material from the other of the first and second portions.

2. (Original) The method of claim 1, further comprising:

selecting the planarizing pad material to have a thickness of from about 0.002 inch to about 0.010 inch; and

forming the recesses in the surface of the planarizing pad material to have a depth of from about 0.001 inch to about 0.004 inch measured from the surface of the planarizing pad material.

3. (Original) The method of claim 1 wherein the surface of the planarizing pad material is a first surface and the planarizing pad material has a second surface opposite the first surface, further comprising exposing the second surface to the

selected energy source to change the solubility of the planarizing pad material to a selected depth beneath the second surface.

4. (Original) The method of claim 1, further comprising selecting the first portion of the surface of the planarizing pad material to include a plurality of uniformly spaced regions.

5. (Original) The method of claim 1, further comprising selecting the first portion of the surface of the planarizing pad material to include a plurality of randomly spaced regions.

6. (Original) The method of claim 1 wherein the surface of the planarizing pad material is a first surface and the planarizing pad material has a second surface opposite the first surface, further comprising attaching the second surface of the planarizing pad material to a substrate material to support the planarizing pad material.

7. (Original) The method of claim 6, further comprising selecting the substrate material to include polyester.

8. (Original) The method of claim 6, further comprising selecting the substrate material to have a thickness of from about 0.001 inch to about 0.010 inch.

9. (Original) The method of claim 1 wherein the surface of the planarizing pad material is a first surface, the planarizing pad material having a second surface opposite the first surface, further comprising:

selecting a substrate material to transmit the selected radiation from the energy source;

attaching the substrate material to the second surface of the planarizing pad material to support the planarizing pad material; and

exposing the second surface to the selected radiation to cure the planarizing pad material to a selected depth beneath the second surface by irradiating the

substrate material with the selected radiation and passing the selected radiation through the substrate material to the second surface of the planarizing material.

10. (Original) The method of claim 1 wherein the planarizing pad material has a protective film adjacent to the surface of the planarizing pad material, further comprising removing the protective film after exposing the planarizing pad material to the energy source and before exposing the planarizing pad material to the solvent.

11. (Original) The method of claim 1, further comprising curing the planarizing pad material at an elevated temperature to strengthen and harden the planarizing pad material.

12. (Original) The method of claim 1 wherein exposing the planarizing pad material to the selected energy source includes exposing the planarizing pad material to ultraviolet radiation.

13. (Original) The method of claim 1, further comprising selecting the solvent from nonyl acetate and benzyl alcohol.

14. (Original) The method of claim 1, further comprising:

attaching the planarizing pad material to an elongated substrate material to form an elongated planarizing pad; and

rolling the elongated planarizing pad upon itself to form a roll.

15. (Original) The method of claim 1, further comprising selecting the planarizing pad material to have a generally circular planform shape.

16. (Original) The method of claim 1 wherein selectively exposing the first portion of the planarizing pad material without exposing the second portion of the planarizing pad material includes positioning a mask proximate to the surface of the

planarizing pad material with an opaque region of the mask aligned with the second portion of the planarizing pad material to block the selected radiation from the selected energy source from striking the second portion and an at least partially transmissive region of the mask aligned with the first portion of the planarizing pad material to transmit the selected radiation to the first portion.

17. (Original) The method of claim 1, further comprising selecting the planarizing pad material to include a photopolymer.

18. (Original) The method of claim 1 wherein exposing the first portion of the planarizing pad material to the selected energy source includes increasing a solubility of the first portion.

19. (Original) The method of claim 1 wherein exposing the first portion of the planarizing pad material to the selected energy source includes decreasing a solubility of the first portion.

20. (Cancelled)

21. (Original) The method of claim 1, further comprising selecting the planarizing surface material to have a Shore D hardness in the range of from about 50 to about 80.

22. (Original) The method of claim 1 wherein the planarizing pad material includes an elongated film having a first end and a second end, further wherein exposing the planarizing pad material to a selected energy source and exposing the planarizing pad material to a solvent are each performed at one or more stations between the first end and the second end in a continuous process as the planarizing pad material moves relative to the stations.

23. (Previously Presented) A method for forming a planarizing pad for planarizing a microelectronic substrate, comprising:

exposing a rear surface of a radiation-sensitive planarizing pad material to a selected radiation to change the solubility of the planarizing pad material proximate to the rear surface, the radiation-sensitive planarizing pad material including fixed abrasive elements for abrading the microelectronic substrate;

positioning a mask proximate to a front surface of the planarizing pad material facing opposite the rear surface of the planarizing pad material to allow transmission of the selected radiation to a first portion of the front surface and block transmission of the selected radiation to a second portion of the front surface adjacent to the first portion of the front surface;

exposing the mask and the planarizing pad material to a selected radiation to irradiate the first portion of the planarizing pad material; and

forming a plurality of recesses in the front surface of the planarizing pad material configured to support a planarizing liquid proximate to the front surface of the planarizing pad material during planarization of the microelectronic substrate by exposing the planarizing pad material to a solvent to remove material from one of the first and second portions of the planarizing pad material at a greater rate than removing material from the other of the first and second portions.

24. (Original) The method of claim 23, further comprising:

selecting the planarizing pad material to have a thickness of from about 0.002 inch to about 0.010 inch; and

forming the recesses in the surface of the planarizing pad material to have a depth of from about 0.001 inch to about 0.004 inch measured from the surface of the planarizing pad material.

25. (Original) The method of claim 23, further comprising attaching to the rear surface of the planarizing pad material a substrate material that is at least partially transparent to the selected radiation.

26. (Original) The method of claim 25, further comprising selecting the substrate material to include polyester.

27. (Original) The method of claim 25, further comprising selecting the substrate material to have a thickness of from about 0.001 inch to about 0.010 inch.

28. (Original) The method of claim 23, further comprising curing the planarizing pad material at an elevated temperature to strengthen the front surface.

29. (Original) The method of claim 23 wherein exposing the rear surface of the planarizing pad material includes irradiating the planarizing pad material with ultraviolet radiation.

30. (Original) The method of claim 23, further comprising:
attaching the planarizing pad material to an elongated substrate material to form an elongated planarizing pad; and
rolling the elongated planarizing pad upon itself to form a roll.

31. (Original) The method of claim 23 wherein irradiating the first portion of the planarizing pad material includes decreasing a solubility of the first portion.

32. (Cancelled)

33. (Original) The method of claim 23 wherein the planarizing pad material includes an elongated film having a first end and a second end, further wherein exposing the planarizing pad material to a selected radiation and exposing the planarizing pad material to a solvent are each performed at one or more stations between the first end and the second end in a continuous process as the planarizing pad material moves relative to the stations.

34. (Original) The method of claim 23, further comprising exposing the rear surface of the planarizing pad material for a time sufficient to change the solubility of the planarizing pad material to a depth of from about 0.001 inch to about 0.009 inch measured from the rear surface.

35. (Previously Presented) A method for forming a planarizing pad for planarizing a microelectronic substrate, comprising:

selectively exposing a first portion of an energy-sensitive mold material to a selected energy source without exposing a second portion of the mold material adjacent to the first portion to the selected energy source;

exposing the mold material to a solvent to remove material from one of the first and second portions at a greater rate than removing material from the other of the first and second portions, forming texture elements that project outwardly from the surface of the mold material; and

pressing together the texture elements of the mold material and a planarizing pad material to form recesses in the planarizing pad material that are configured to support a planarizing liquid proximate to the surface of the planarizing pad material during planarization of the microelectronic substrate, the planarizing pad material including fixed abrasive elements for abrading the microelectronic substrate.

36. (Original) The method of claim 35 wherein the planarizing pad material is elongated along a planarizing pad axis and the mold material encircles a rotation axis transverse to the planarizing pad axis with the texture elements facing outwardly from the rotation axis, further comprising rotating the mold material relative to the planarizing pad material about the rotation axis while the texture elements of the mold material engage the planarizing pad material.

37. (Original) The method of claim 35 wherein the mold material defines a generally flat plane and engaging the texture elements of the mold material with the planarizing pad material includes pressing one of the mold material and the planarizing

pad material against the other in a direction inclined relative to the plane of the mold material.

38. (Original) The method of claim 35, further comprising selecting the planarizing pad material from a thermoplastic material and a thermoset material.

39. (Original) The method of claim 35, further comprising:

selecting the planarizing pad material to have a thickness of from about 0.002 inch to about 0.010 inch;

forming texture elements to project outwardly from the surface of the mold material by from about 0.001 inch to about 0.004 inch; and

forming the recesses in the surface of the planarizing pad material to have a depth of from about 0.001 inch to about 0.004 inch measured from the surface of the planarizing pad material.

40. (Original) The method of claim 35, further comprising selecting the texture elements to have an approximately uniform spacing.

41. (Original) The method of claim 35, further comprising selecting the texture elements to have a random spacing.

42. (Original) The method of claim 35 wherein the surface of the mold material is a first surface and the mold material has a second surface opposite the first surface, further comprising exposing the second surface to the selected energy source to alter the solubility of the mold material to a selected depth beneath the second surface.

43. (Original) The method of claim 35 wherein the surface of the mold material is a first surface, the mold material having a second surface opposite the first surface, further comprising:

selecting a substrate material that transmits the selected radiation from the selected energy source therethrough;

attaching the substrate material to the second surface of the mold material to support the mold material; and

exposing the second surface of the mold material to the selected radiation to alter the solubility of the mold material to a selected depth beneath the second surface by irradiating the substrate material with the selected radiation and passing the selected radiation through the substrate material to the second surface of the planarizing pad material.

44. (Original) The method of claim 35 wherein exposing the mold material to the selected energy source includes exposing the mold material to ultraviolet radiation.

45. (Original) The method of claim 35, further comprising:

attaching the planarizing pad material to an elongated substrate material to form an elongated planarizing pad; and

rolling the elongated planarizing pad upon itself to form a roll.

46. (Original) The method of claim 35, further comprising selecting the planarizing pad material to have a generally circular platform shape.

47. (Original) The method of claim 35 wherein exposing the first portion of the mold material to the selected energy source includes increasing a solubility of the first portion.

48. (Cancelled)

49. (Original) A method for forming a fixed-abrasive planarizing pad for planarizing a microelectronic substrate, comprising:

distributing abrasive elements in a radiation-sensitive planarizing pad material;

selectively irradiating a first portion of a surface of the planarizing pad material with a selected radiation without irradiating a second portion of the surface of the planarizing pad adjacent to the first portion; and

forming a plurality of recesses and contact surfaces at the surface of the planarizing pad material configured to support a planarizing liquid proximate to the surface of the planarizing pad material during planarization of the microelectronic substrate by exposing the planarizing pad material to a solvent to remove material from one of the first and second portions of the planarizing pad material at a greater rate than removing material from the other of the first and second portions.

50. (Original) The method of claim 49, further comprising selecting the abrasive elements from ceria, titania, alumina, and calcium carbonate.

51. (Original) The method of claim 49, further comprising distributing chalk in the planarizing pad material to uniformly disperse the abrasive elements in the planarizing pad material.

52. (Original) The method of claim 49, further comprising selecting the planarizing pad material to include a carbonaceous material to control a hardness of the planarizing pad material.

53. (Original) The method of claim 52 wherein selecting the carbonaceous material includes selecting graphite.

54. (Withdrawn) The method of claim 52 wherein selecting the carbonaceous material includes selecting an amorphous carbon material.

55. (Original) The method of claim 49, further comprising:

selecting the planarizing pad material to have a thickness of from about 0.002 inch to about 0.010 inch; and

forming the recesses in the surface of the planarizing pad material to have a depth of from about 0.001 inch to about 0.004 inch measured from the surface of the planarizing pad material.

56. (Original) The method of claim 49 wherein the surface of the planarizing pad material is a first surface and the planarizing pad material has a second surface opposite the first surface, further comprising exposing the second surface to the selected radiation to cure the planarizing pad material to a selected depth beneath the second surface.

57. (Original) The method of claim 49 wherein the surface of the planarizing pad material is a first surface, the planarizing pad material having a second surface opposite the first surface, further comprising:

selecting a substrate material to transmit the selected radiation;

attaching the substrate material to the second surface of the planarizing pad material to support the planarizing pad material; and

exposing the second surface to the selected radiation to cure the planarizing pad material to a selected depth beneath the second surface by irradiating the substrate material with the selected radiation and allowing the selected radiation to pass through the substrate material to the second surface of the planarizing pad material.

58. (Original) The method of claim 49, further comprising curing the planarizing pad material at an elevated temperature to strengthen and harden the planarizing pad material.

59. (Original) The method of claim 49, further comprising:

attaching the planarizing pad material to an elongated substrate material to form an elongated planarizing pad; and

rolling the elongated planarizing pad upon itself to form a roll.

60. (Original) The method of claim 49 wherein irradiating the first portion of the planarizing pad material includes increasing a solubility of the first portion.

61-71. (Cancelled)

72. (Previously Presented) A method for forming a planarizing pad for planarizing a microelectronic substrate, comprising:

selectively irradiating a first portion of a non-sacrificial layer of radiation-sensitive material defining a planarizing surface without irradiating a second portion of the non-sacrificial layer adjacent to the first portion of the planarizing surface, the radiation-sensitive material including fixed abrasive elements for abrading the microelectronic substrate; and

forming a recess in the non-sacrificial layer in one of the first portion or the second portion by selectively removing material from the one of the first portion or the second portion faster than removing material from the other of the first portion or the second portion.

73. (Original) The method of claim 72 wherein the planarizing surface is a first surface, the non-sacrificial layer having a second surface facing opposite the first surface and irradiating the second portion of the non-sacrificial layer includes irradiating the second surface to an intermediate depth between the first and second surfaces.

74. (Original) The method of claim 72 wherein forming a recess includes configuring the recess to support a planarizing liquid proximate to the planarizing surface of the non-sacrificial layer during planarization of the microelectronic substrate.

75. (Original) The method of claim 72 wherein selectively removing material includes etching the material.

76. (Cancelled)

77. (Cancelled)

78. (Previously Presented) A planarizing pad for planarizing a microelectronic substrate, formed by the process comprising:

selectively irradiating a first portion of a surface of a planarizing pad material with a selected radiation without irradiating a second portion of a surface of the planarizing pad material adjacent to the first portion, the planarizing pad material including fixed abrasive elements for abrading the microelectronic substrate; and

forming a plurality of recesses and contact elements at the surface of the planarizing pad material by exposing the planarizing pad material to a solvent to remove material from one of the first and second portions of the planarizing pad material at a greater rate than removing material from the other of the first and second portions, the recesses being configured to support a planarizing liquid proximate to the surface of the planarizing pad material during planarization of the microelectronic substrate, the contact elements having engaging portions defining a generally flat plane.

79. (Original) The planarizing pad of claim 78, wherein the process further comprises:

selecting the planarizing pad material to have a thickness of from about 0.002 inch to about 0.010 inch; and

forming the recesses in the surface of the planarizing pad material to have a depth of from about 0.001 inch to about 0.004 inch measured from the surface of the planarizing pad material.

80. (Original) The planarizing pad of claim 78 wherein the surface of the planarizing pad material is a first surface, the planarizing pad material having a second surface opposite the first surface, the process further comprising:

selecting a substrate material to transmit the selected radiation;

attaching the substrate material to the second surface of the planarizing pad material to support the planarizing pad material; and

exposing the second surface to the selected radiation to cure the planarizing pad material to a selected depth beneath the second surface by irradiating the substrate material with the selected radiation.

81. (Original) The planarizing pad of claim 78, wherein the process further comprises:

attaching the planarizing pad material to an elongated substrate material to form an elongated planarizing pad; and

rolling the elongated planarizing pad upon itself to form a roll.

82. (Original) The planarizing pad of claim 78, wherein the process further comprises selecting the planarizing pad material to have a generally circular planform shape.

83. (Original) The planarizing pad of claim 78 wherein irradiating the first portion of the planarizing pad material includes decreasing a solubility of the first portion.

84. (Original) The planarizing pad of claim 78 wherein the planarizing pad material includes an elongated film having a first end and a second end, further wherein irradiating the planarizing pad material and exposing the planarizing pad material to a solvent are each performed at one or more stations between the first end and a second end in a continuous process as the planarizing pad material moves relative to the stations.

85. (Previously Presented) A planarizing pad for planarizing a microelectronic substrate, comprising a photosensitive pad body having a planarizing surface with a plurality of recesses and projections photopatterned directly therein, each projection having an engaging surface positioned to engage the microelectronic substrate, each recess being configured to support a planarizing liquid adjacent to the microelectronic substrate, the photosensitive pad body including fixed abrasive elements for abrading the microelectronic substrate.

86. (Original) The planarizing pad of claim 85 where in the planarizing body has a thickness of from about 0.002 inch to about 0.010 inch and the recesses have a depth of from about 0.001 inch to about 0.004 inch measured from the planarizing surface.

87. (Original) The planarizing pad of claim 85 wherein the pad body has a rear surface opposite the planarizing surface, further comprising a substrate material adjacent to the rear surface and at least partially transmissive of a selected radiation that changes a solubility of the pad body.